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Two ammonite species of the genus *Sharpeiceras* from the Cretaceous of Hokkaido

(Studies of Cretaceous ammonites from Hokkaido and Sakhalin-LXXXI)

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Abstract. ***Sharpeiceras mexicanum*** **(Böse, 1928) has been recently found in a mudstone unit of Hirotomi in the Monbetsu Valley, south-central Hokkaido. It possesses the adult body chamber, which has not been well shown in the hitherto described specimens of this species.** ***Sharpeiceras kikuae*** **Matsumoto and Kawashita, 1995 is redescribed in this paper, since it was established as an appendix to a stratigraphic paper written in Japanese and seems to have been little noticed. It came from a mudstone member in the lower part of the Middle Yezo Subgroup in the Oyubari area, central Hokkaido. It is somewhat similar to** ***S. florencae*** **Sapth but has a wider umbilicus, less crowded ribs on the septate whorls and more distinctly separated two lateral tubercles. In these respects it seems to resemble** ***S. mocambiquense*** **(Choffat), but the available material is insufficient for exact comparison. The two species described indicate an early Cenomanian age for the fossiliferous mudstone.**

Key words: Adult body chamber, Cenomanian, Hokkaido, ***Sharpeiceras kikuae, Sharpeiceras mexicanum.***

Introduction

In this paper two ammonite species of the genus *Sharpeiceras* recently acquired by one of us (Y.K.) are described. They were found independently from two separate areas in Hokkaido, but they are valuable for taxonomy and for biostratigraphic correlation.

Repository.—The specimens from Hokkaido described in this paper are housed in the following institution or collection, with abbreviation at the heading ;

MCM : Mikasa City Museum, Mikasa 068-2111

YKC : Yoshitaro Kawashita Collection, temporarily in his residence (Tomatsu-Chiyoda, Mikasa 068-2134), but eventually to be transferred to some institutions

The numbering of YKC refers to the date of acquisition, e.g., 060625=25 June 1994 [the first two digits refer to the Japanese era year, Heisei 6].

Palaeontological description

Family Acanthoceratidae Grossouvre, 1894
Subfamily Mantelliceratinae Hyatt, 1903
Genus ***Sharpeiceras*** Hyatt, 1903

Type species.—*Ammonites laticlavius* Sharpe, 1855.

Remarks.—General accounts of this genus have been given by several authors, e.g., Matsumoto *et al.* (1969), Wright and Kennedy (1984), Howarth (1985) and Wright (1996). The genus occurs in the Lower Cenomanian, but its accurate relationships with other genera have yet to be worked out. In some of the hitherto described species, the characters of the adult body chamber are not sufficiently known.

Sharpeiceras mexicanum (Böse, 1928)

Figures 1 and 2

Mantelliceras laticlavium (Sharpe) var. *mexicanum* Böse, 1928, p. 253, pl. 10, fig. 6 ; pl. 11, fig. 1.

Sharpeiceras mexicanum (Böse), Young and Powell, 1976, p. 19, pl. 7, figs 1, 3 ; Mancini, 1982, p. 254, fig. 6e ; Howarth, 1985, p. 88, figs 20, 23.

'*Sharpeiceras laticlavium* var. *mexicanum*' (Böse, 1928), Wright and Kennedy, 1987, p. 128, text-fig. 31.

Holotype.—A specimen described by Böse, 1928 (see above) from the Buda Limestone of Mexico, by monotypy.

Material.—MCM T260 [=previous YKC 080416A] (Figure 1) and another incomplete specimen [YKC 060625] from the Chennai-zawa, southern branch of the Monbetsu River near Hirotomi. For the location readers may refer to Matsumoto *et al.* (1997, fig. 1).

Description.—MCM T260 is large and preserves the body

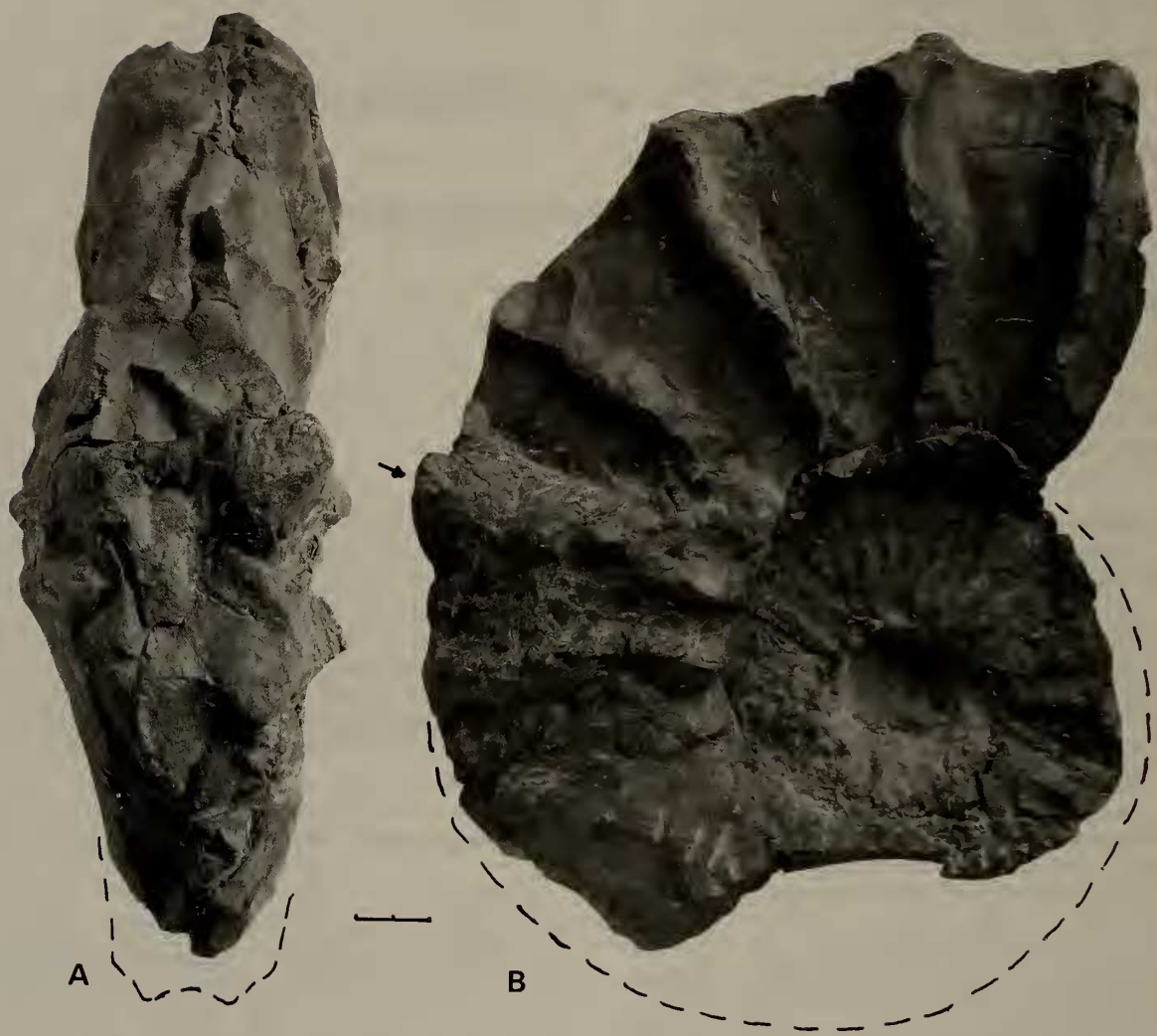

Figure 1. *Sharpeiceras mexicanum* (Böse). MCM T260 [=previous YKC 080416A] from the Chennai-zawa, a branch of the Monbetsu River. Back (**A**) and left side (**B**) views, ×0.5. Arrow mark indicates the beginning of body chamber. Bar scale: 20 mm. Photos by K. Shinohara.

chamber for more than a quarter whorl, but its right side and its ventral part is more or less eroded and partly destroyed. In spite of the incomplete preservation, it shows to some extent important characters of the species.

Should the body chamber be assumed as half a whorl as in other well preserved specimens of *Sharpeiceras*, the entire shell diameter would be more than 300 mm, i.e. nearly as large as *S. kongo* Matsumoto, Muramoto and Takahashi, 1969 (p. 261, pl. 29, fig. 1; pl. 30, fig. 1).

The shell is rather evolute, but the rate of whorl expansion is fairly high. The umbilical ratio (U/D) is moderate at maturity (0.36-0.37) but is low in earlier stages (≦0.30; Table 1). Whorl section is subrectangular, higher than broad and roughly parallel-sided, with an abruptly bent umbilical shoulder and a low but nearly vertical umbilical wall (Figure 2).

On the inner whorl ribs are numerous and dense, with frequent bifurcation at the umbilical tubercle or with intercalation at variable distance from the umbilical edge (Figure 1). Each rib has also mid-lateral, outer and inner ventrolateral tubercles. Many ribs are gently flexuous or weakly bent at the tubercle, but some are weakly prorsiradiate or nearly rectiradiate. In the late part of the septate stage, for about half a whorl, the ribs become single and gradually separated. On the adult body chamber the ribs are strong, thick and distantly spaced, but some of them continue to be weakly flexuous; the tubercles also strengthen. The umbilical tubercles on the main part of the body chamber are spinose and upright, as is observable on YKC 060625 (Figure 2). The lateral tubercles are bullate; the rounded inner and clavate outer ventrolateral tubercles tend to share a common base, but are not completely united

Table 1. Measurements of *Sharpeiceras mexicanum* (above) and *S. laticlavium* (below).

Specimen	D	U	U/D	H	H/D	B	B/D	B/H	H/h
MCM T260 (E)	~270	96.0	.36	117.0	.43	88.0	.33	.75	1.75
MCM T260 (LS, ic)	~212	78.0	.37	86.0	.41	~64	.30	.74	~1.79
HT (Böse)	119.8	36.3	.30	54.8	.46	~38	.32	.69	–
Howarth, fig. 20	127.0	34.0	.27	55.4	.44	38.2	.30	.69	1.47
Mancini	–	–	–	46.5	–	34.1	–	.73	–
HT (E, c)*	130	34	.26	59	.45	50	.38	.85	1.45

D=diameter, U=width of umbilicus, H=whorl height, B=whorl breadth, h=whorl height at half a whorl back from measured H, HT=holotype, E=preserved end, LS=last septum, c=costal, ic=intercostal, ~=approximate, Linear dimensions in mm. * Measured by T.M.

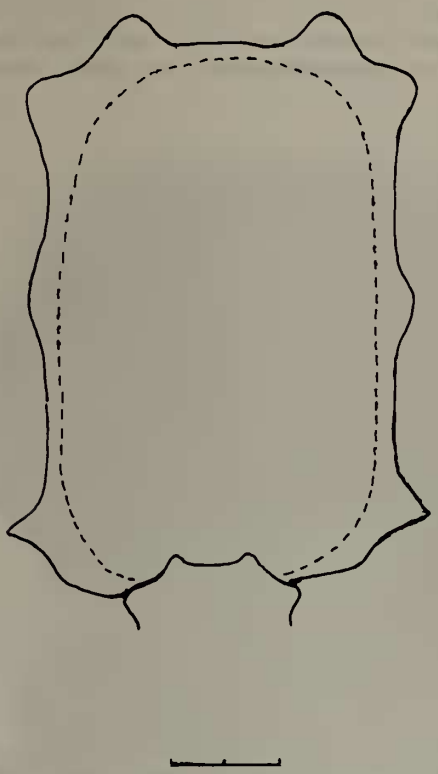

Figure 2. *Sharpeiceras mexicanum* (Böse). Restored cross-section of the adult body chamber, based on MCM T260 and YKC 060625. Bar scale: 20 mm.

and not horned.

The suture is partly observable.

Dimensions.—See Table 1.

Comparison and discussion.—The characters of the inner whorl of the specimens described above are well comparable with those of the holotype and other examples of *Sharpeiceras mexicanum* from Mexico (Böse, 1928), Texas (Young and Powell, 1976; Mancini, 1982) and Angola (Howarth, 1985). In these hitherto reported specimens the characters of the adult body chamber were not well shown. Mancini's specimen shows the change in the mode of ribbing from the dense and bifurcated or intercalated state on the younger whorl to the single, gradually separated state, but it lacks the body chamber. In our specimen a similar change of ornament is observable in the late part of the phragmocone, and on the adult body chamber the ribs strengthen and become widely spaced.

The holotype of *Sharpeiceras laticlavium* (Sharpe, 1855, p. 31, pl. 14, fig. 1) (refigured by Wright and Kennedy, 1987, pl. 41, fig. 4), which one of us (T.M.) examined in London, is a wholly septate internal mould and 130 mm in diameter. One of the figured specimens of *S. mexicanum* from Angola (Howarth, 1985, fig. 20) is similar to that holotype in lateral view of the shell shape and the rib density. The holotype of *S. mexicanum*, as illustrated by Wright and Kennedy (1987, text-fig. 31), seems to have somewhat more crowded ribs. Thus, Böse may have been reasonable in regarding the specimen from Mexico as a variety of Sharpe's species. There is, however, a considerable difference in the proportion of B/H; namely, 0.69 in the specimens of Böse and Howarth as compared with 0.84 in Shape's holotype (See Table 1). Furthermore, the ribs in the early growth stages are frequently bifurcated at the umbilical bullae or have intercalated ones and are often gently sinuous in *S. mexicanum*. In contrast they are mostly, if not exclusively, single and straight in *S. laticlavium*. In these respects of the ribbing in earlier growth stages our specimen from Hokkaido is certainly identical with *S. mexicanum*.

The ratio of B/H in the measured parts of Mancini's and Hokkaido specimens is somewhat higher (0.71-0.75) than that of Böse's holotype (0.69), but this is for the whorl of later growth stages. It is undoubtedly lower than B/H value at the last part of the holotype of *S. laticlavium*.

We do not know the ornament on the adult body chamber of Sharpe's holotype. Hyatt's specimen illustrated by Wright and Kennedy (1987, text-fig. 30) shows a near-adult phragmocone plus the beginning of the body chamber of *S. laticlavium*. More recently Marcinowski *et al.* (1996, pl. 13, fig. 1) have illustrated a fine specimen of *S. laticlavium* from the Lower Cenomanian of Kazakhstan, in which the adult body chamber is fully preserved. In these two examples of late growth stage the ribs very gradually become coarser and are separated by interspaces slightly wider than the ribs. In our specimen of *S. mexicanum* the ribs are much stronger and more distantly spaced at the corresponding growth stage.

Strictly speaking, the available material from a particular stratigraphic unit of a given area is not sufficient for forming

an adequate concept of a species. Tentatively, *S. mexicanum* is regarded as allied to but distinct from *S. laticlavium*.

S. mexicanum is undoubtedly more compressed and shows a higher rate of whorl expansion than *S. florencae* Spath, 1925 (p. 198, p. 37) (see also Howarth, 1985). The latter has more rigid ribs and stronger tubercles; of which the ventrolateral ones on the adult body chamber may become horn-like.

Occurrence.—As for material. The Upper Cretaceous sequence in the Hirotomi area of the Monbetsu Valley is provisionally subdivided into Members A1, A2, B, C1, C2, and D by A. Inoma (personal information), as indicated by Matsumoto *et al.* (1997, fig. 1). The specimen described above came from Member A1 (mudstone) in the Chennai-zawa, a short branch rivulet of the Monbetsu River, southern-central Hokkaido. *Desmoceras* (*Pseudouhligella*) *japonicum* Yabe, *Parajaubertella kawakitana* Matsumoto and *Gabbioceras yezoense* Shigeta are among the main associates. Member A1 is, hence, most probably assignable to the Lower Cenomanian.

Outside Japan, *S. mexicanum* has been recorded from the Lower Cenomanian of Mexico (Buda Limestone), Texas (Buda Limestone and Grayson Formation) and Angola.

Sharpeiceras kikuae Matsumoto and Kawashita, 1995

Figures 3 and 4

Sharpeiceras kikuae Matsumoto and Kawashita, *In* Nishida *et al.*, 1995, Appendix, p. 186, pl. 5, figs. 1a, b.

Remarks.—This species was established in an appendix to a stratigraphic paper of Nishida *et al.* (1995) written in Japanese. Although the palaeontologic description was in English, it seems to have been little noticed. For this reason

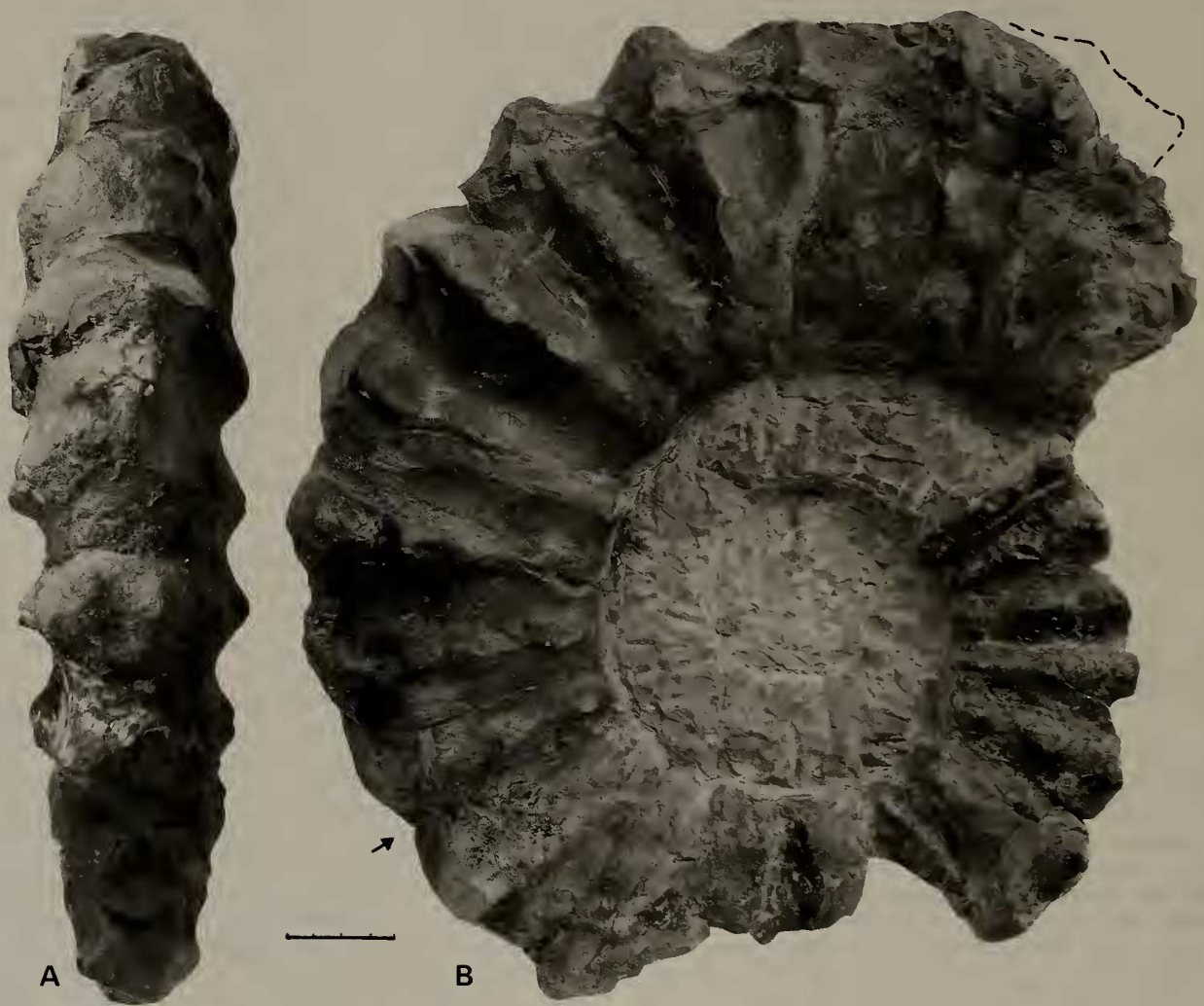

Figure 3. *Sharpeiceras kikuae* Matsumoto and Kawashita. Holotype, MCM T244 [=previous YKC 060628] from loc. Y5091, Oyubari area. Back (**A**) and left side (**B**) views, ×0.375. Arrow mark same as in Fig. 1. Bar scale: 40 mm. Photos by K. Shinohara.

this species is redescribed and supplemented herein, in agreement with the Editor and the senior author (T. Nishida) of the original paper.

Material.—Holotype is MCM T244 [=previous YKC 060628] (Figures 3 and 4A) obtained at loc. Y5091 on the right side of the Shirakin River of the Oyubari area, central Hokkaido. It was embedded in a stratum of mudstone at about the middle (horizon Y5091B) of the outcrop as long as 70 m. Also two other fragmentary pieces of a large body chamber [YKC 090523] (Figure 4B) are in the subsequent acquisition by Y.K. at loc. S901, left side of the same river, about 700 m upstream from loc. Y5091. The above two localities are indicated in a paper by Nishida *et al.* (1993, figs. 1, 4). The Shirakin River is called the synonymous Hakkinzawa in that paper.

Diagnosis.—Shell very large, rather evolute and ornamented by moderately to fairly widely spaced, strong, rectiradiate ribs on the outer whorl; each rib provided with two lateral tubercles. The main part of the adult body chamber suboval in section, with somewhat convex flanks and sloping umbilical wall; septate whorl subrectangular in section.

Description.—The shell is very large, showing a fairly wide umbilicus, evolute coiling and a rather moderate rate of whorl expansion (Figure 3). The septate whorl is subrectangular in section, somewhat higher than broad: the body chamber, which occupies half a whorl, is ovate in intercostal section with somewhat convex flanks and sloping umbilical wall (Figure 4A, B).

The ribs on the late part of the phragmocone and the adult body chamber are mostly single, strong, rectiradiate and moderately to fairly widely separated. The umbilical bulla is pointed at the umbilical edge; the two lateral tubercles are bullate, with the normal one at about the mid-flank and the smaller one on the outer flank; the inner ventrolateral tubercle is the most prominent and the outer one is clavate; they are somewhat thickened and on the body chamber tend to have a common base (Figure 4B). The ribs and tubercles are strongest in the middle part of the body chamber. A few ribs on the adoral part of the body chamber are narrower and less strong (Figure 3).

The ornamentation of the inner whorl is not well shown because of the poor preservation. The ribs seem to be somewhat denser and narrower.

The sutures are exposed here and there and follow the general pattern of *Sharpeiceras*.

Dimensions.—See Table 2.

Comparison and discussion.—In the stout ornament and the general outline of the whorl section this species is similar to *Sharpeiceras florencae* Spath (1925, p. 198, pl. 37), from Mozambique, Angola and other regions (see Howarth, 1985, p. 88), but it has a distinctly wider umbilicus. Its adult body chamber is oval in section instead of the thickly rectangular one of *S. florencae*. The two lateral tubercles are very clear in *S. kikuae*, in contrast to one lateral tubercle in the holotype of *S. florencae*. An example illustrated by Howarth (1985, fig. 17) seems to show a tendency to the doubling of a lateral tubercle, but that is by no means distinct.

On the grounds of the above comparison, we have regarded the described specimen as a species which is allied to but distinct from *S. florencae*.

S. kikuae may be allied to *S. mocambiquense* [=*Acanthoceras laticlavium* var. *mocambiquensis* Choffat, 1903, p. 25, pl. 4, fig. 3; pl. 7, fig. 2] in the large size and the two lateral tubercles. The specimen from Mozambique is flat-sided, whereas our specimen has somewhat convex sides and coarser and stronger ornament from a late septate stage onward. With respect to the measured proportions of U/D (Table 2) *S. mocambiquense* is more similar to *S. florencae* than to *S. kikuae*, but the former seems to be allied to *S. schlueteri* Hyatt (see Wright and Kennedy, 1987, p. 130). At any rate the available material is insufficient for a definite conclusion.

Occurrence.—As for material. Loc. Y5091 is an outcrop of steeply inclined dark gray mudstone with some intercalated thin layers of sandstone for a distance of 70 m on the right side of the Shirakin River. The exposed part is assigned to the lower part of the Middle Yezo Subgroup. *Desmoceras* (*Pseudouhligella*) cf. *japonicum* occurs commonly there. In the eastern part of the outcrop *Inoceramus* aff. *reachensis* Etheridge (see Nishida *et al.*, 1993, pl. 6, fig. 1) occurs commonly. The exposed part is, thus, probably the Lower Cenomanian. Loc. S901 on the eastern limb of an anticline is nearly at the same stratigraphic level as loc. Y5091 and "*Sharpeiceras* aff. *vohipalense* Collignon" was reported to occur there (Matsumoto and Suekane, 1987, p. 3, pl. 1, figs. 1-3); also *Inoceramus* aff. *reachensis* [="*I. virgatus* Schlüter"

Table 2. Measurements of *Sharpeiceras kikuae* (above) and three other species. I: *S. florencae*, II: *S. schlueteri*, and III: *S. mocambiquense*.

Specimen	D	U	U/D	H	H/D	B	B/D	B/H	H/h	R
MCM T244 (M, c)	~348	140	.40	128	.37	~96	.28	.75	1.60	12
I. HT (E, c)*	220	69	.31	86	.39	–	–	–	1.32	9
I. HT (LS, ic)*	~165	56	.34	63	.38	54	.33	.86	1.37	13
Howarth, fig. 15	–	–	–	79	–	63.5	–	.80	–	>9
II. LT (~)	348	135	.39	123	.35	102	.29	.83	1.37	13
III. HT (E-150°, ic)	350	100	.29	132	.38	96	.27	.73	1.38	12

M=at the middle of the adult body chamber; LT=lectotype, R=number of ribs per half a whorl. Other abbreviations same as in Table 1.

* Measurements on the illustration of Spath (1925, pl. 37). They are not quite conformable with his indication (*op. cit.*, p. 198) of relative proportions.

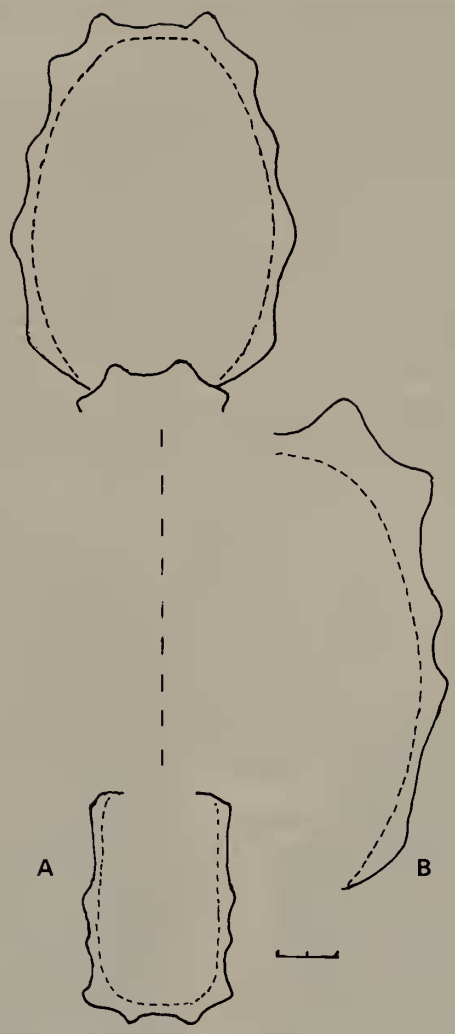

Figure 4. *Sharpeiceras kikuae* Matsumoto and Kawashita. **A**: Diagrammatic section of the holotype across the middle part of the adult body chamber (above) and that of the septate part half a whorl adaptically from it. **B**: Sectional view (sketch) of a fragmentary piece (left half) of a large body chamber [YKC 090523] from loc. S901, showing the convex flank and the disposition of the tubercles. Bar scale: 20 mm.

of Matsumoto *et al.* (1987, fig. 8-2 only)] was found at a nearby locality.

Acknowledgements

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